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(71) Applicant(s)
Samsung Electronics Co Limited
(Incorporated in the Republic of Korea)
416 Maetan-dong, Paldal-gu, Suwon-city,
Kyungki-do, Republic of Korea

(72) Inventor(s)
Jeon-Man Park
Kyung-Yun Roo

(74) Agent and/or Address for Service
Dibb Lupton Alsop
Fountain Precinct, Balm Green, SHEFFIELD, S1 1RZ,
United Kingdom

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TXTEP1, TXTUS1, TXTUS2

(54) Abstract Title
System for allowing a subscriber to use a sim card in a cdma service area

(57) A CDMA terminal includes an interface for connecting a SIM card to a terminal controller. The terminal reads unique subscriber information from the card, and sends that information to a CDMA subsystem. The subsystem assigns a unique management number to the terminal and sends verification to the terminal when the unique subscriber information has been verified by a SIM card network subsystem. A public network connects the CDMA subsystem and the SIM card subsystem which is part of a GSM network, this enables a GSM subscriber to use a SIM card in a CDMA network area. Call charges may be calculated at the CDMA subsystem and sent to the SIM card subsystem. A wireline or SIM card network subscriber may be notified that their call request is an "international call" when they attempt to contact a SIM card in a CDMA network. Additionally, a user of a CDMA terminal may register a phone number in the SIM card or a terminal memory.

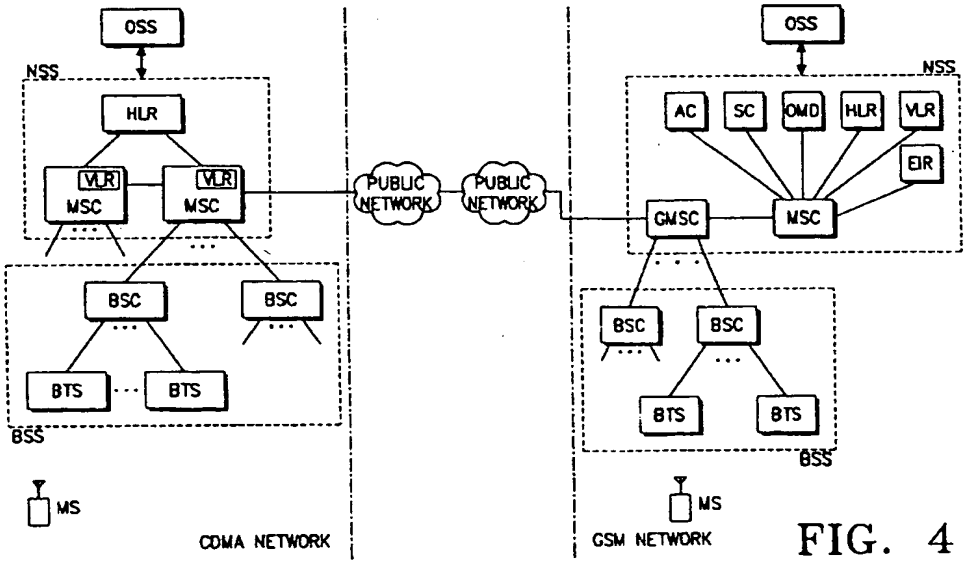

FIG. 4

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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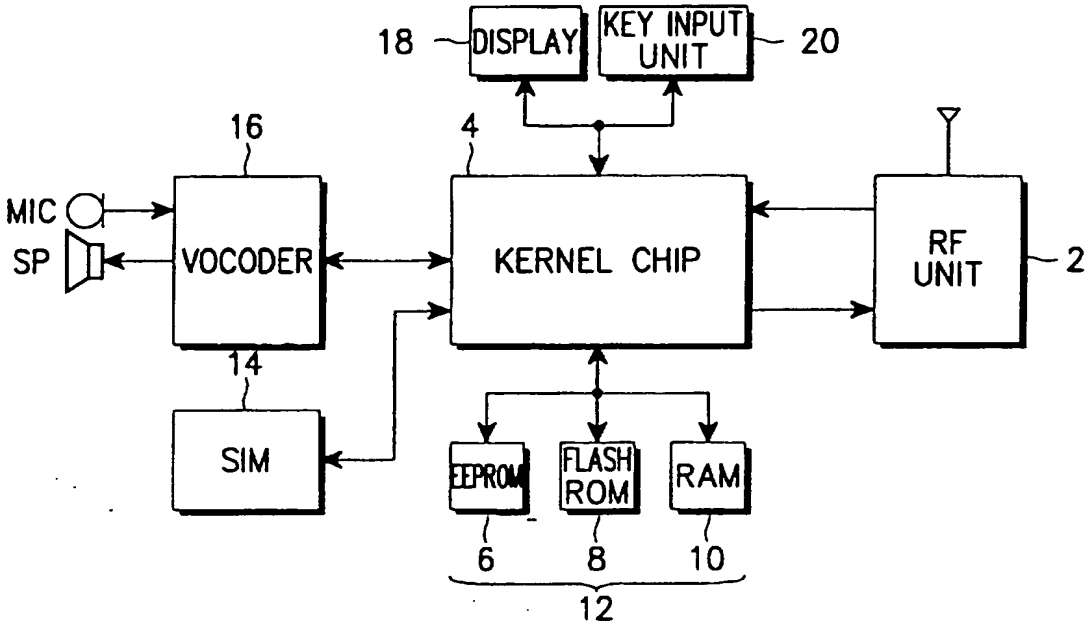
18
DISPLAY
KEY INPUT UNIT
20
16
4
MIC
SP
VOCODER
KERNEL CHIP
RF UNIT
2
14
SIM
EEPROM
FLASH ROM
RAM
6
8
10
12

FIG. 1

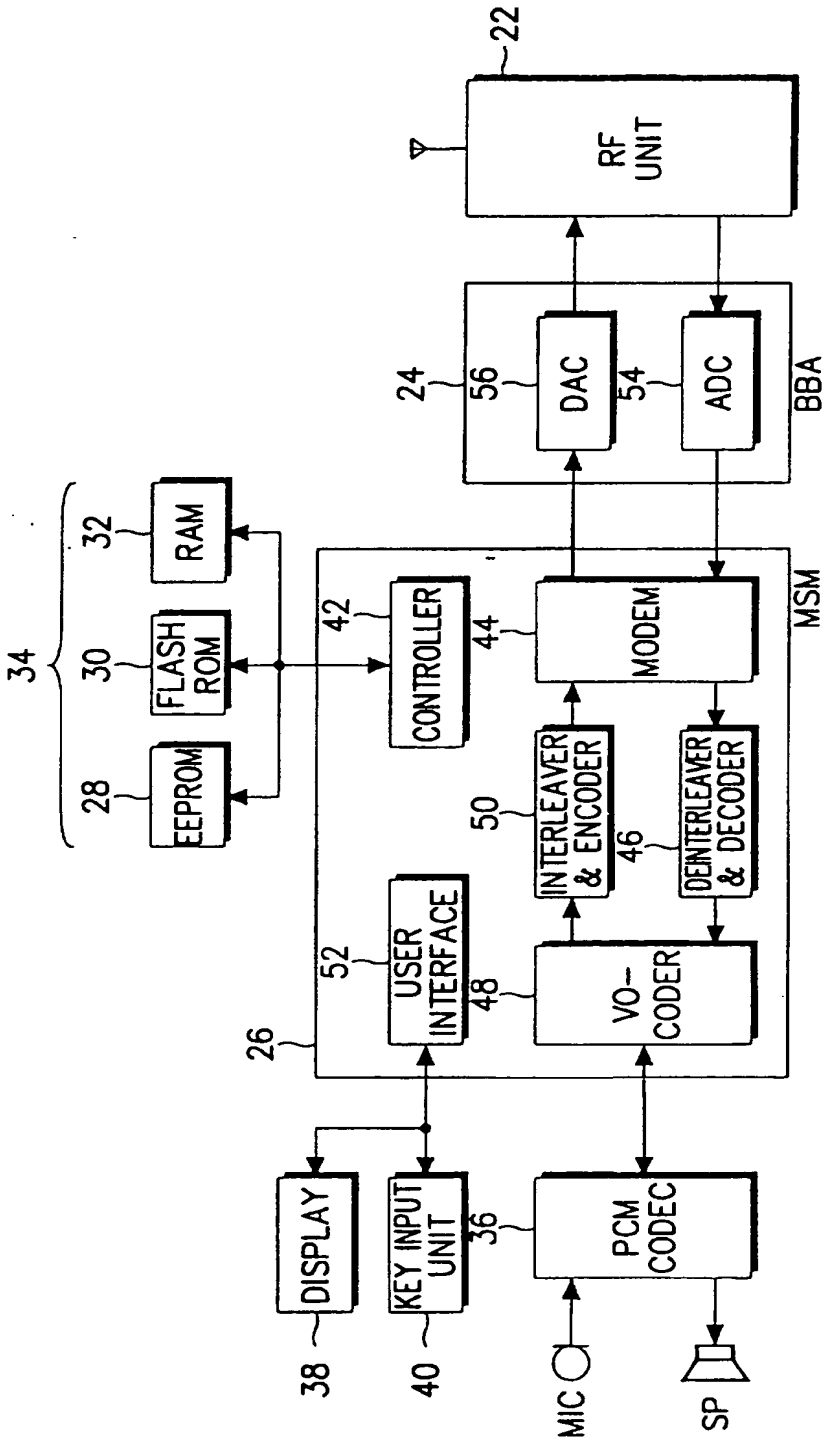
22
RF UNIT
24
56
DAC
54
ADC
BBA
34
32
RAM
30
FLASH ROM
28
EEPROM
42
CONTROLLER
44
MODEM
MSM
50
INTERLEAVER & ENCODER
46
DEINTERLEAVER & DECODER
52
USER INTERFACE
48
VO-CODER
26
DISPLAY
KEY INPUT UNIT
36
PCM CODEC
38
40
MIC
SP

FIG. 2

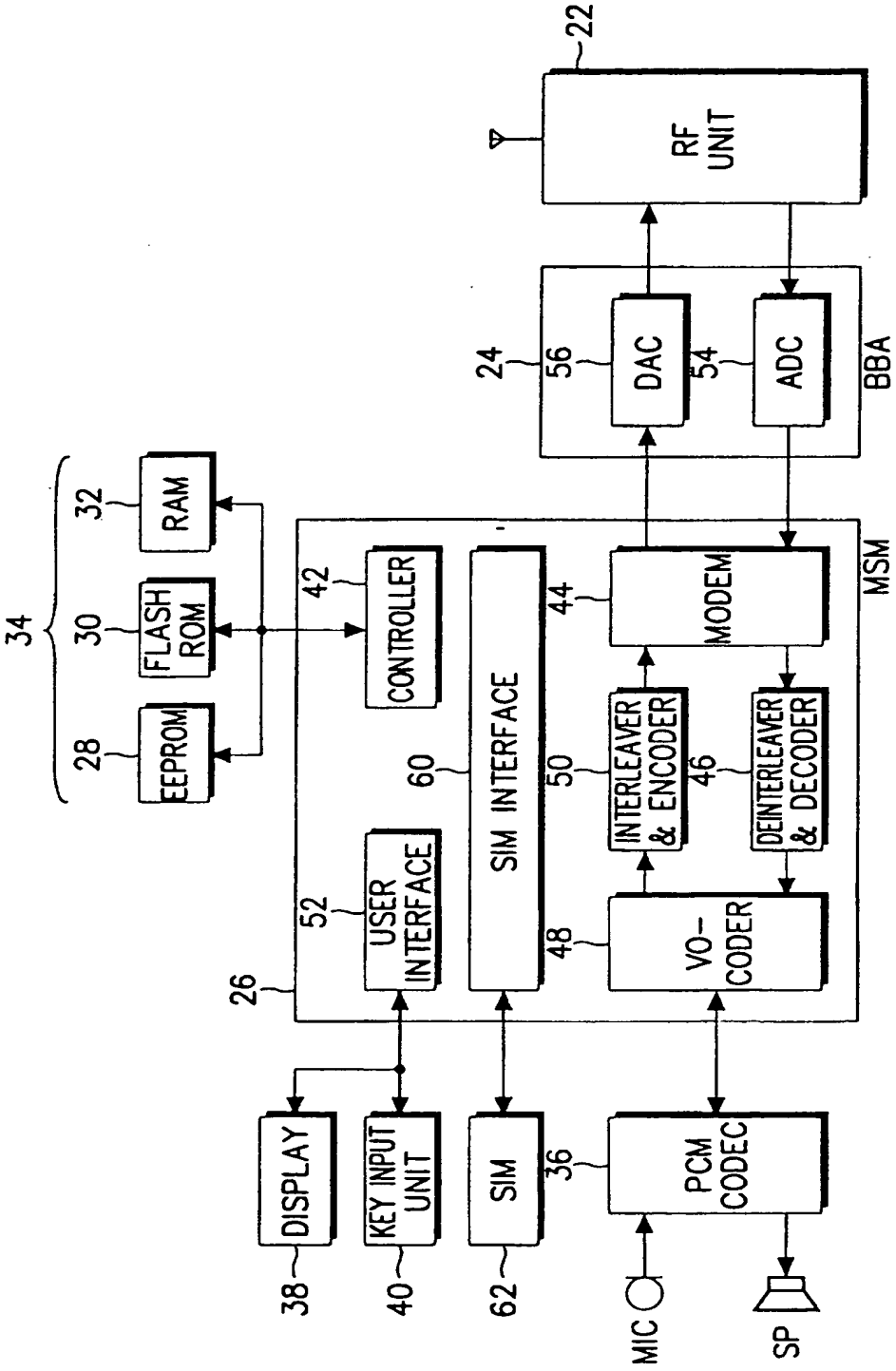
22
RF UNIT
24
56
DAC
54
ADC
BBA
34
32
RAM
30
FLASH ROM
28
EEPROM
42
CONTROLLER
60
SIM INTERFACE
44
MODEM
MSM
50
INTERLEAVER & ENCODER
46
DEINTERLEAVER & DECODER
52
USER INTERFACE
48
VO-CODER
26
DISPLAY
38
KEY INPUT UNIT
40
SIM
62
36
PCM CODEC
MIC
SP

FIG. 3

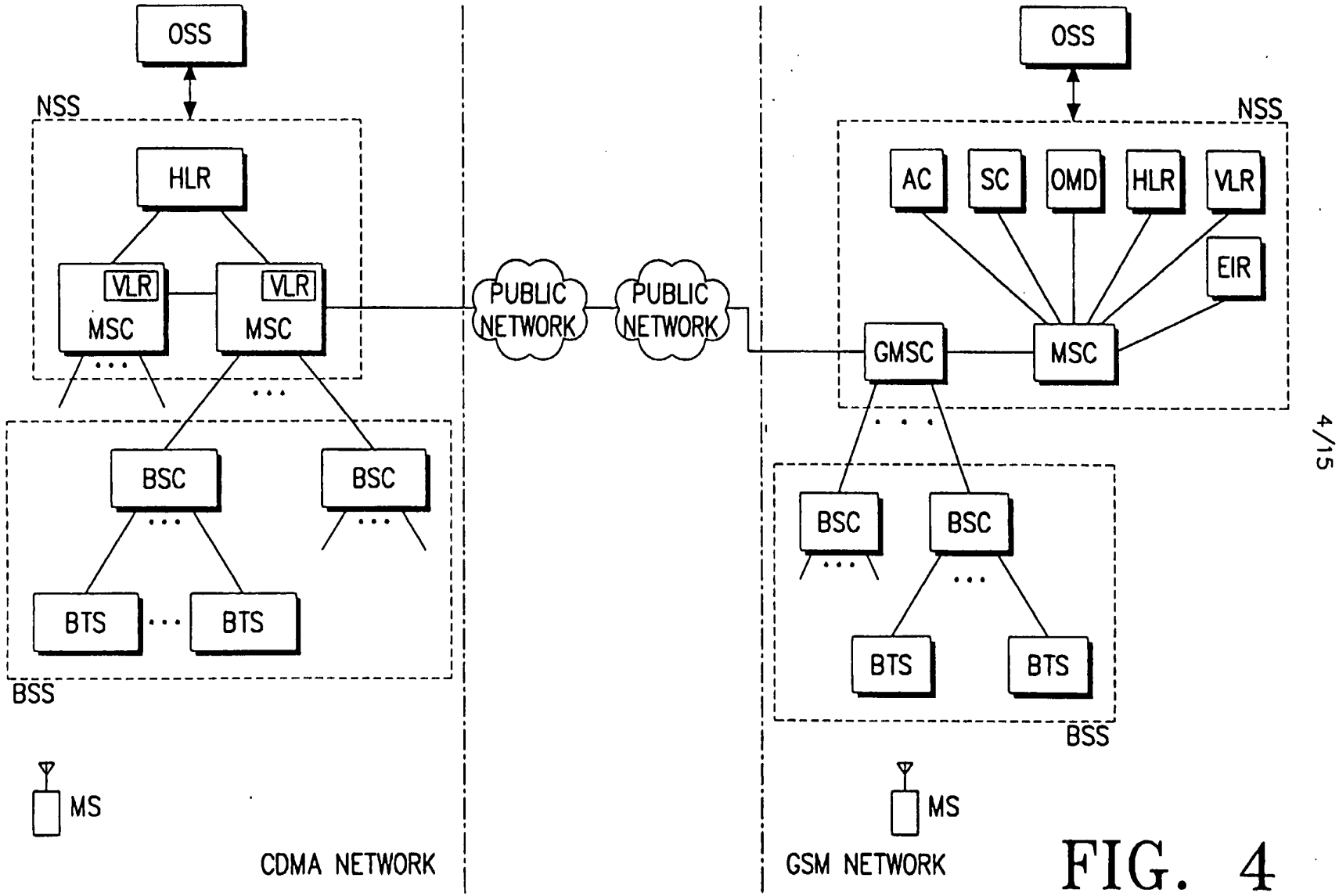
OSS
NSS
HLR
VLR
MSC
VLR
MSC
BSC
BSC
BTS
BTS
BSS
MS
CDMA NETWORK
PUBLIC NETWORK
PUBLIC NETWORK
OSS
NSS
AC
SC
OMD
HLR
VLR
EIR
GMSC
MSC
BSC
BSC
BTS
BTS
BSS
MS
GSM NETWORK

FIG. 4

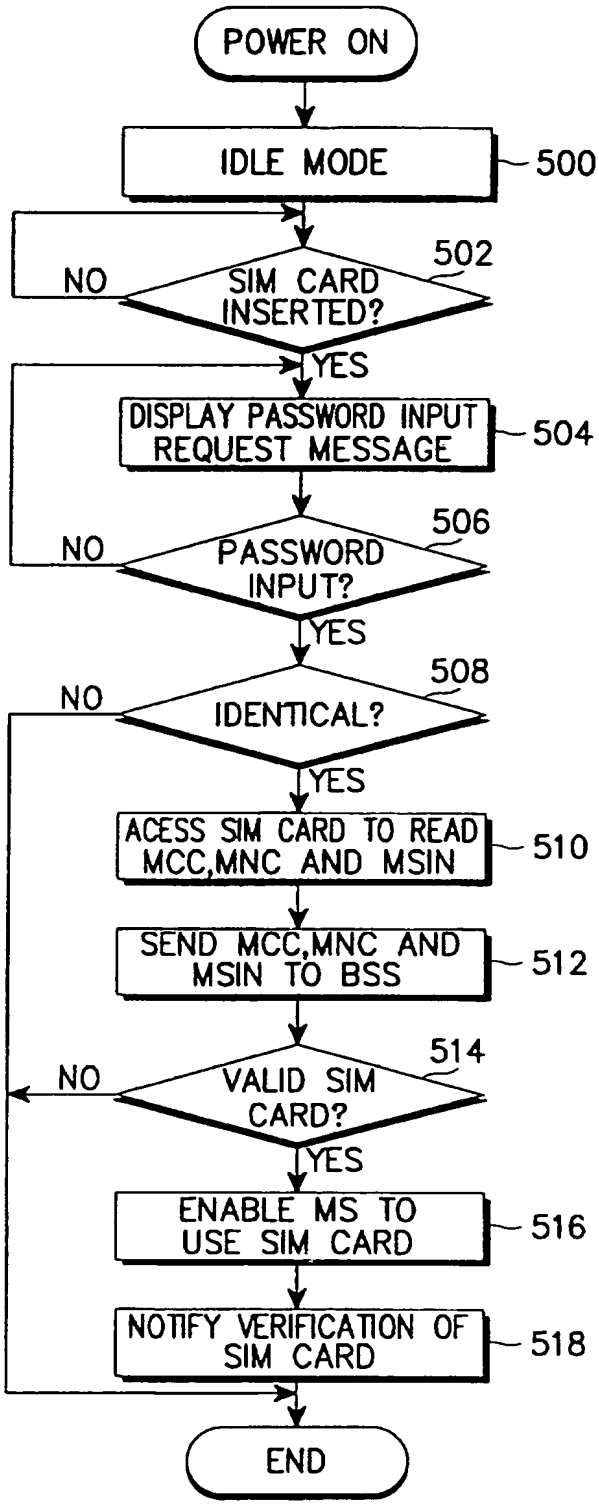
POWER ON
IDLE MODE
500
502
NO
SIM CARD INSERTED?
YES
DISPLAY PASSWORD INPUT REQUEST MESSAGE
504
506
NO
PASSWORD INPUT?
YES
508
NO
IDENTICAL?
YES
ACESS SIM CARD TO READ MCC,MNC AND MSIN
510
SEND MCC,MNC AND MSIN TO BSS
512
514
NO
VALID SIM CARD?
YES
ENABLE MS TO USE SIM CARD
516
NOTIFY VERIFICATION OF SIM CARD
518
END

FIG. 5

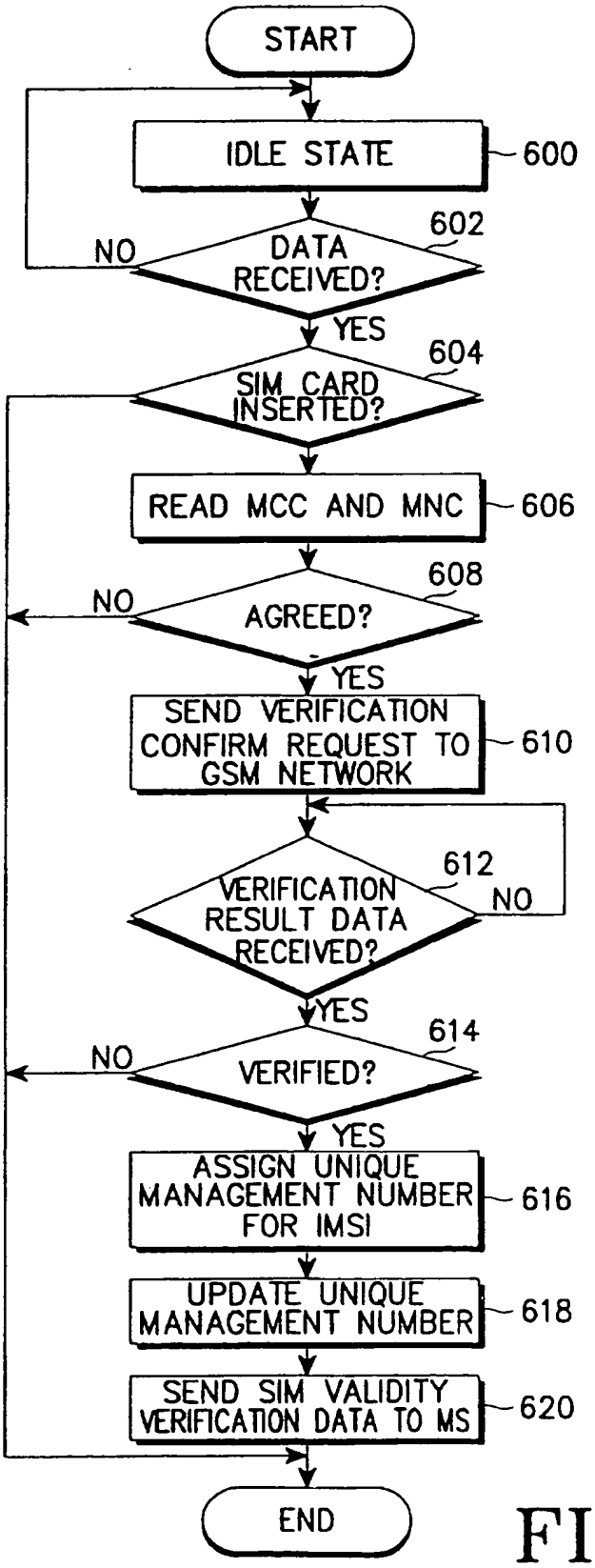
START
IDLE STATE
600
602
NO
DATA RECEIVED?
YES
604
SIM CARD INSERTED?
READ MCC AND MNC
606
608
NO
AGREED?
YES
SEND VERIFICATION CONFIRM REQUEST TO GSM NETWORK
610
612
VERIFICATION RESULT DATA RECEIVED?
NO
YES
614
NO
VERIFIED?
YES
ASSIGN UNIQUE MANAGEMENT NUMBER FOR IMSI
616
UPDATE UNIQUE MANAGEMENT NUMBER
618
SEND SIM VALIDITY VERIFICATION DATA TO MS
620
END

FIG. 6

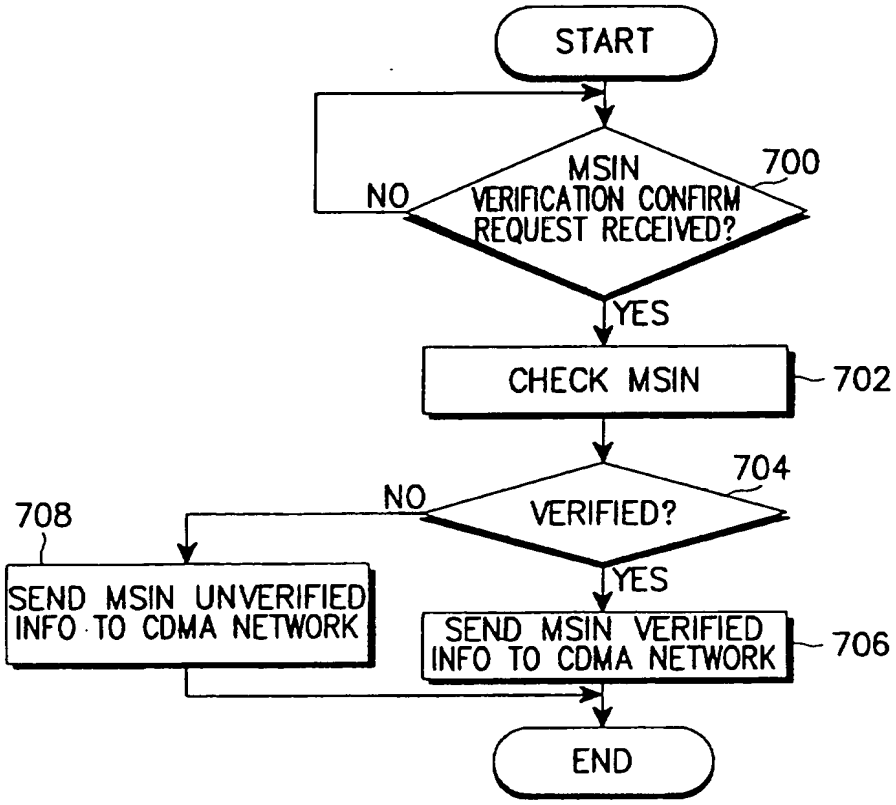
START
MSIN VERIFICATION CONFIRM REQUEST RECEIVED?
700
NO
YES
CHECK MSIN
702
VERIFIED?
704
NO
YES
708
SEND MSIN UNVERIFIED INFO TO CDMA NETWORK
SEND MSIN VERIFIED INFO TO CDMA NETWORK
706
END

FIG. 7

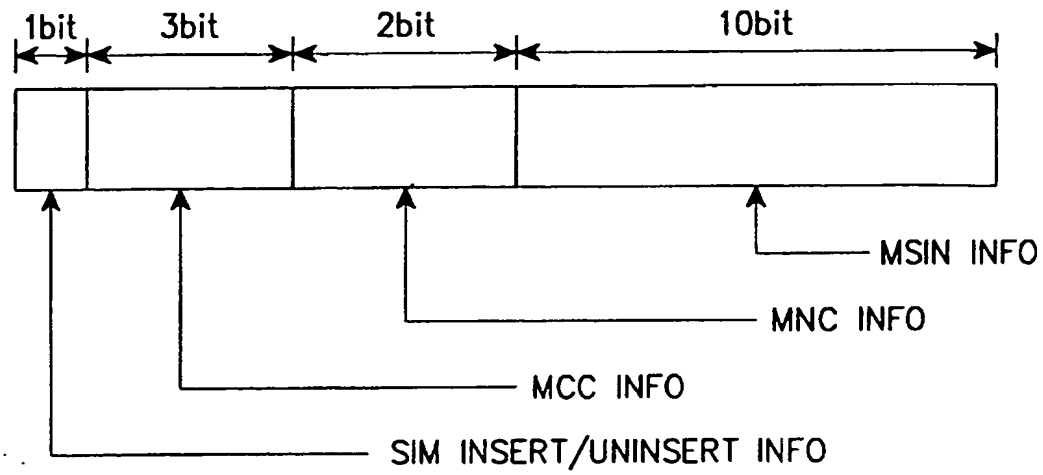
1bit
3bit
2bit
10bit
MSIN INFO
MNC INFO
MCC INFO
SIM INSERT/UNINSERT INFO

FIG. 8

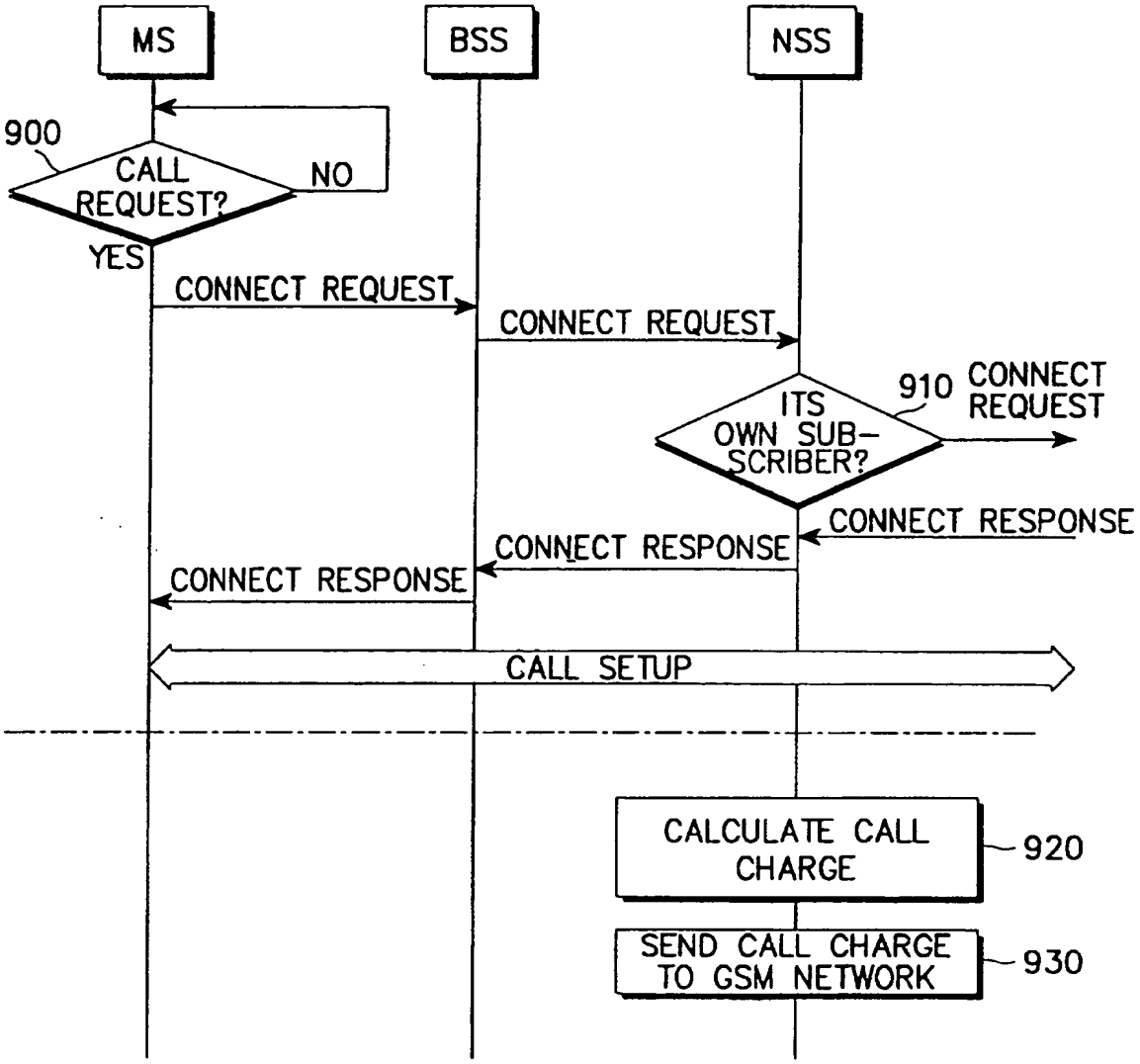
MS
BSS
NSS
900
CALL REQUEST?
NO
YES
CONNECT REQUEST
CONNECT REQUEST
910
ITS OWN SUB-SCRIBER?
CONNECT REQUEST
CONNECT RESPONSE
CONNECT RESPONSE
CONNECT RESPONSE
CALL SETUP
CALCULATE CALL CHARGE
920
SEND CALL CHARGE TO GSM NETWORK
930

FIG. 9

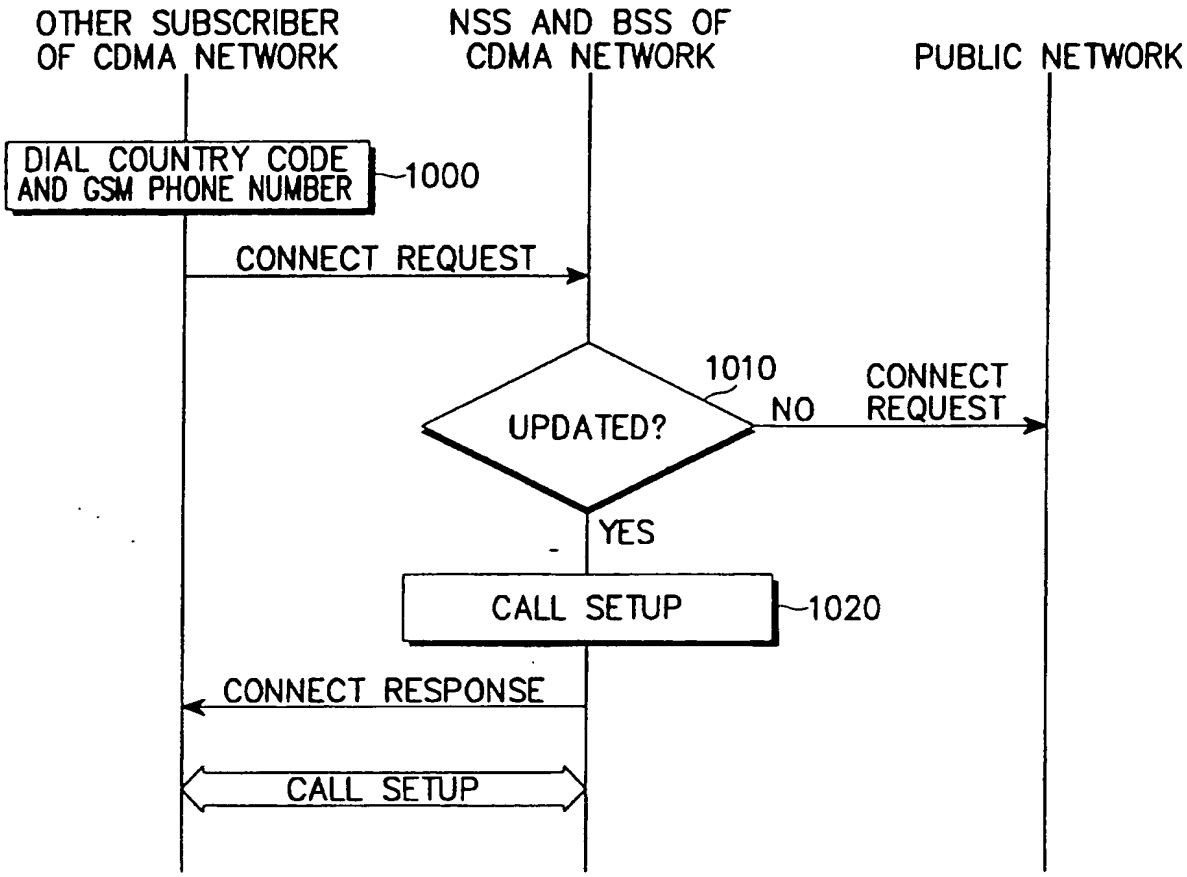
OTHER SUBSCRIBER OF CDMA NETWORK
NSS AND BSS OF CDMA NETWORK
PUBLIC NETWORK
DIAL COUNTRY CODE AND GSM PHONE NUMBER
1000
CONNECT REQUEST
1010
UPDATED?
NO
CONNECT REQUEST
YES
CALL SETUP
1020
CONNECT RESPONSE
CALL SETUP

FIG. 10

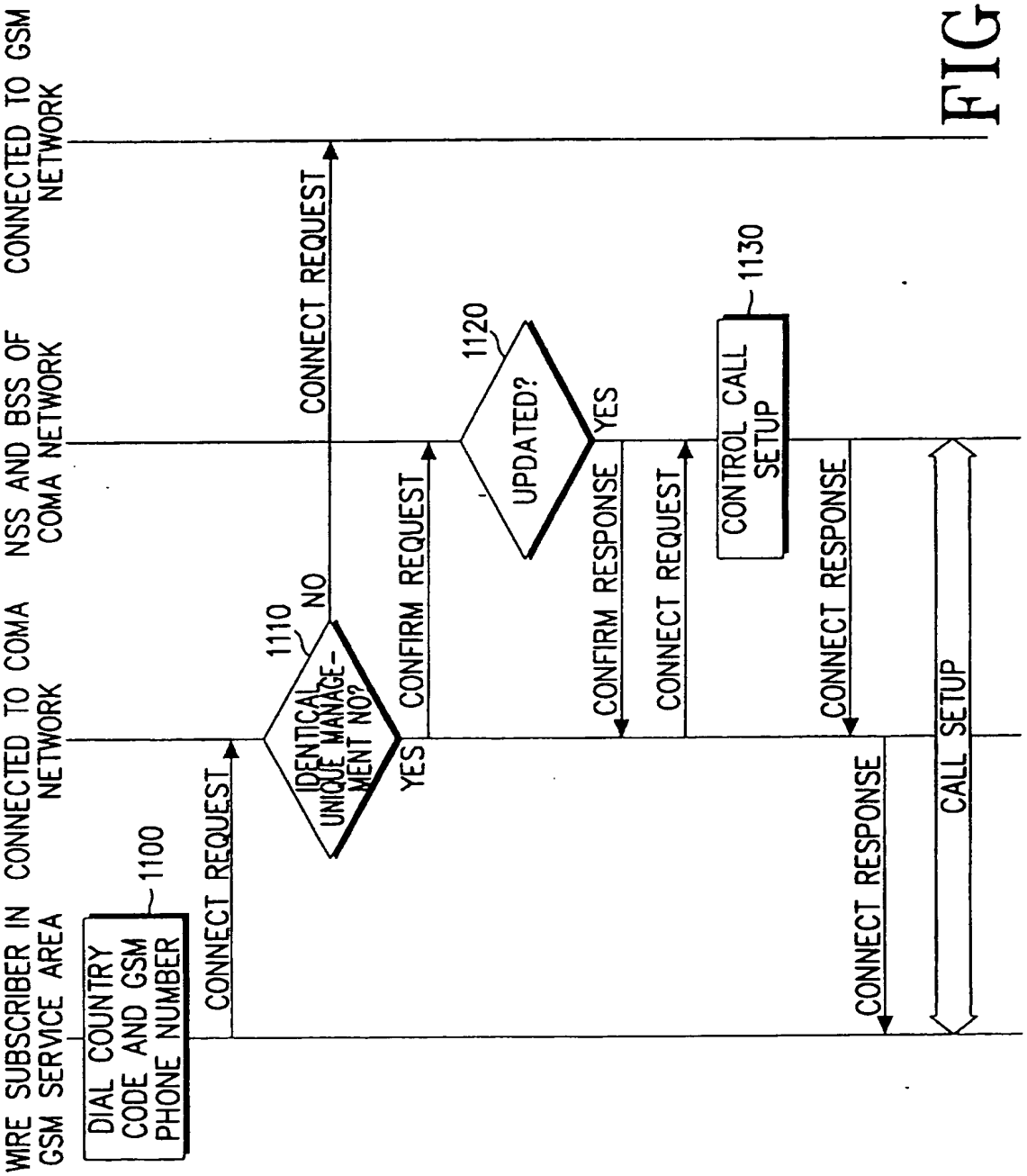
WIRE SUBSCRIBER IN GSM SERVICE AREA
PUBLIC NETWORK CONNECTED TO COMA NETWORK
NSS AND BSS OF COMA NETWORK
PUBLIC NETWORK CONNECTED TO GSM NETWORK
DIAL COUNTRY CODE AND GSM PHONE NUMBER
1100
CONNECT REQUEST
1110
IDENTICAL UNIQUE MANAGE-MENT NO?
NO
YES
CONNECT REQUEST
CONFIRM REQUEST
1120
UPDATED?
YES
CONFIRM RESPONSE
CONNECT REQUEST
1130
CONTROL CALL SETUP
CONNECT RESPONSE
CONNECT RESPONSE
CALL SETUP

FIG. 11

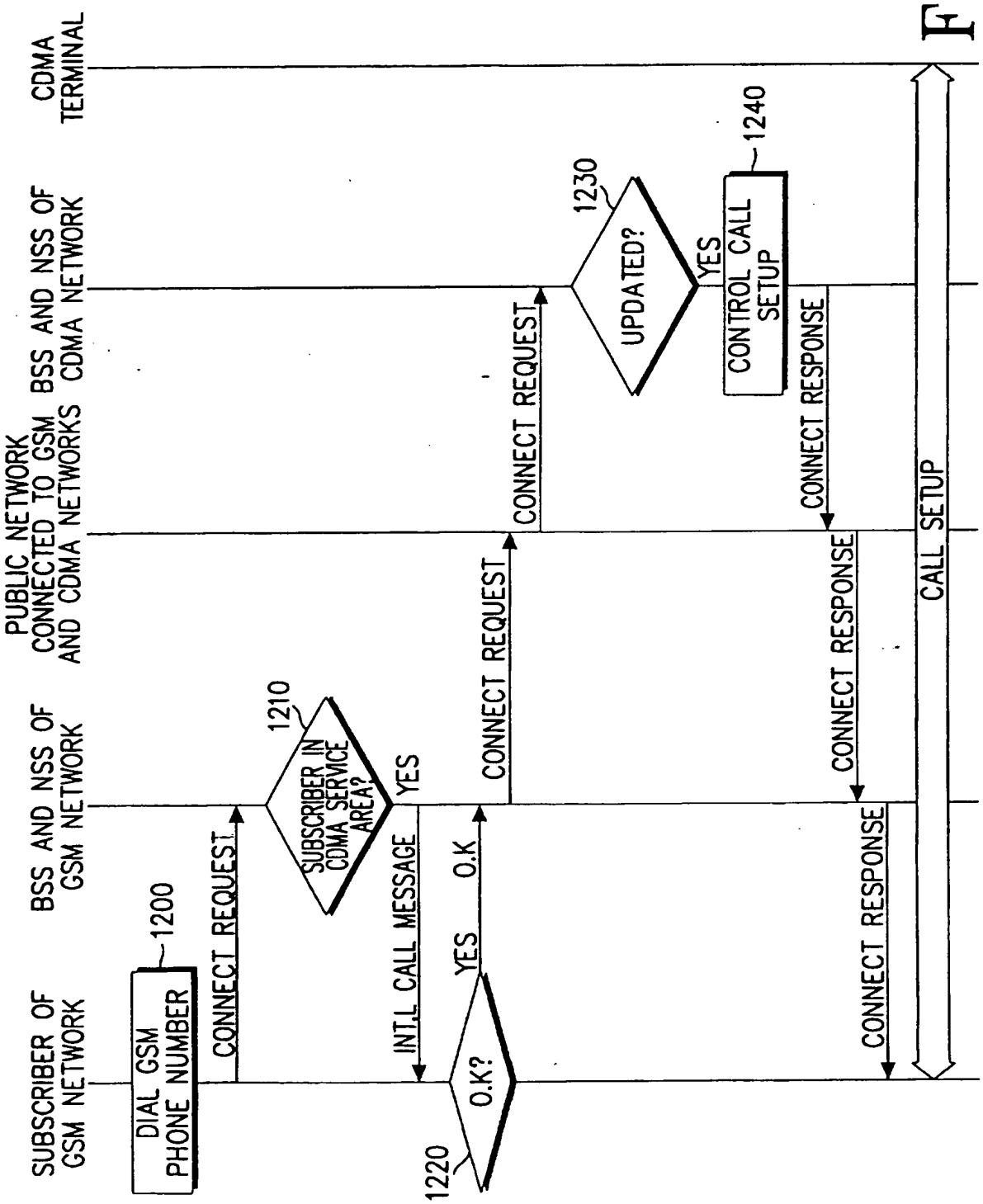
SUBSCRIBER OF GSM NETWORK
BSS AND NSS OF GSM NETWORK
PUBLIC NETWORK CONNECTED TO GSM AND CDMA NETWORKS
BSS AND NSS OF CDMA NETWORK
CDMA TERMINAL
1200
DIAL GSM PHONE NUMBER
CONNECT REQUEST
1210
SUBSCRIBER IN CDMA SERVICE AREA?
YES
INT.L CALL MESSAGE
CONNECT REQUEST
CONNECT REQUEST
1230
UPDATED?
YES
1240
CONTROL CALL SETUP
CONNECT RESPONSE
CONNECT RESPONSE
CONNECT RESPONSE
CALL SETUP
1220
O.K?
YES
O.K

FIG. 12

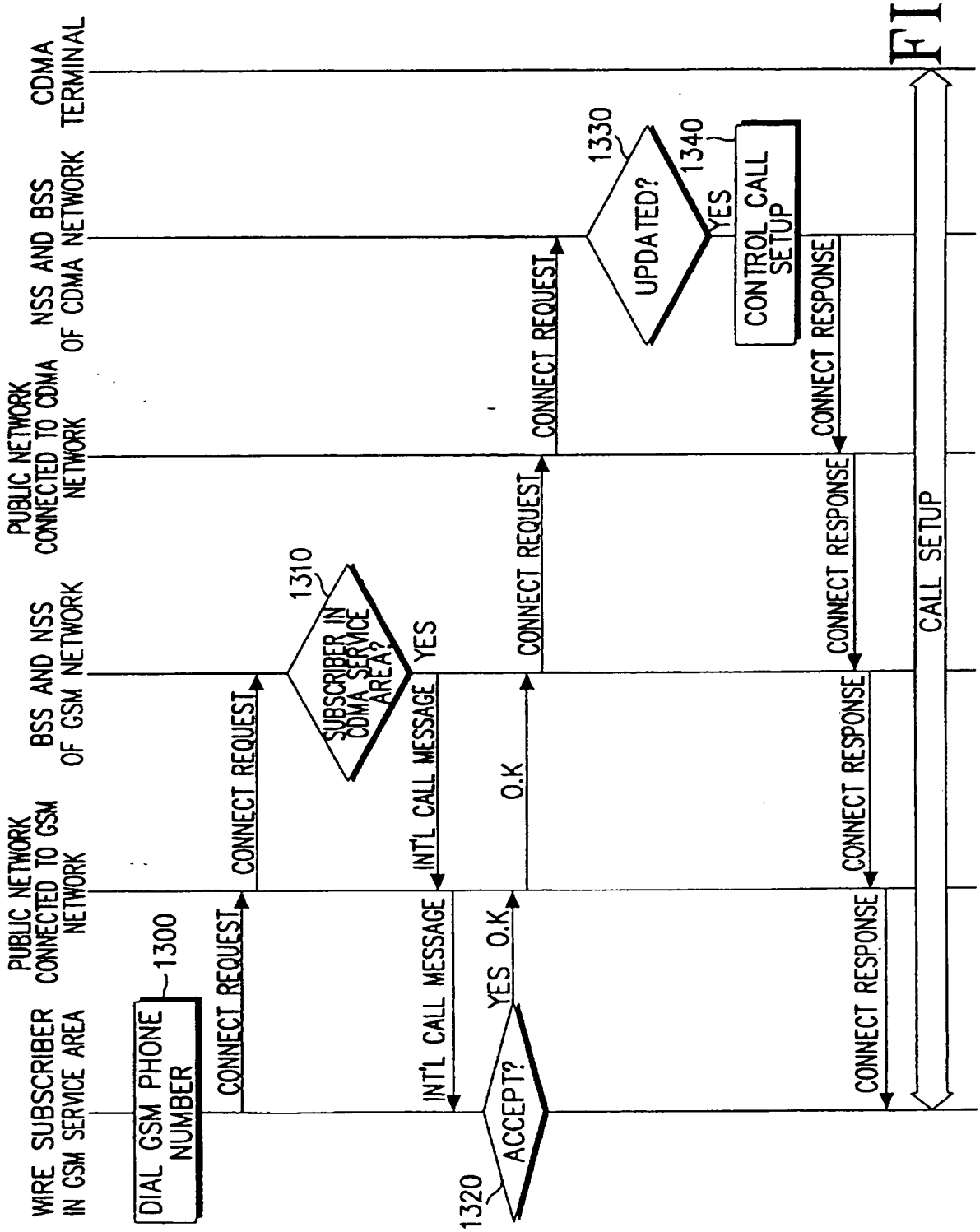
WIRE SUBSCRIBER IN GSM SERVICE AREA
PUBLIC NETWORK CONNECTED TO GSM NETWORK
BSS AND NSS OF GSM NETWORK
PUBLIC NETWORK CONNECTED TO CDMA NETWORK
NSS AND BSS OF CDMA NETWORK
CDMA TERMINAL
DIAL GSM PHONE NUMBER
1300
CONNECT REQUEST
SUBSCRIBER IN CDMA SERVICE AREA?
1310
YES
INT'L CALL MESSAGE
O.K
ACCEPT?
1320
YES O.K
CONNECT REQUEST
CONNECT RESPONSE
CONNECT RESPONSE
CONNECT RESPONSE
UPDATED?
1330
YES
CONTROL CALL SETUP
1340
CALL SETUP

FIG. 13

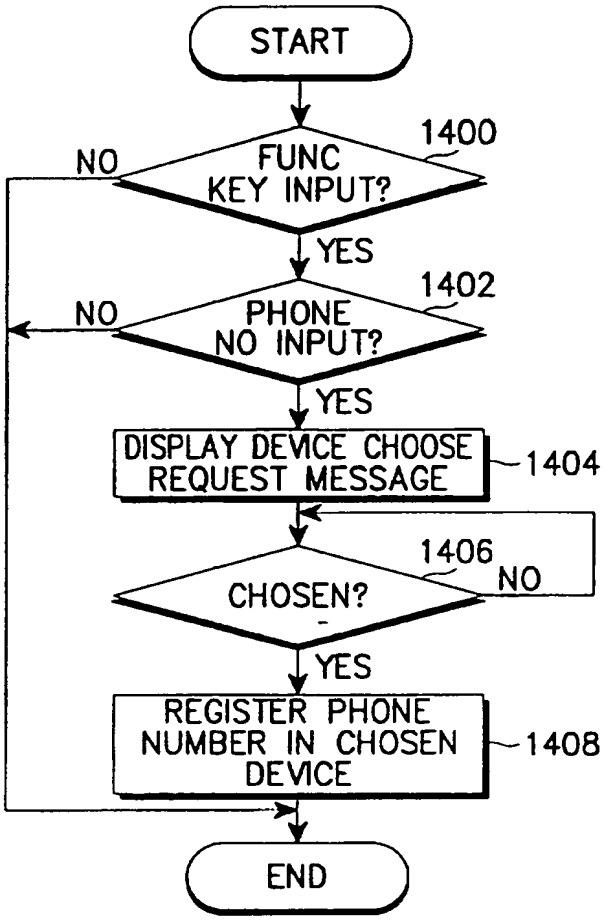
START
1400
FUNC KEY INPUT?
NO
YES
1402
PHONE NO INPUT?
NO
YES
DISPLAY DEVICE CHOOSE REQUEST MESSAGE
1404
1406
CHOSEN?
NO
YES
REGISTER PHONE NUMBER IN CHOSEN DEVICE
1408
END

FIG. 14

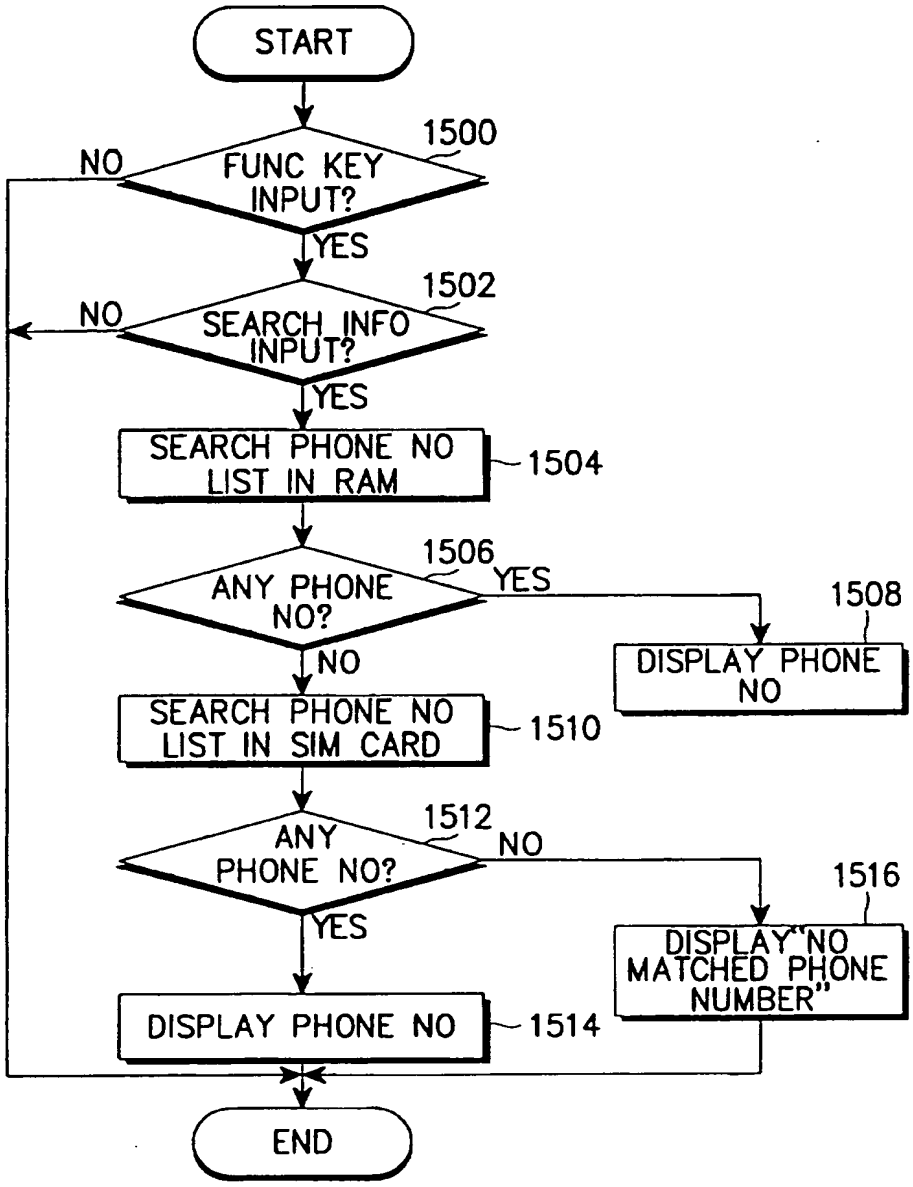
START
1500
FUNC KEY INPUT?
NO
YES
1502
SEARCH INFO INPUT?
NO
YES
SEARCH PHONE NO LIST IN RAM
1504
1506
ANY PHONE NO?
YES
1508
DISPLAY PHONE NO
NO
SEARCH PHONE NO LIST IN SIM CARD
1510
1512
ANY PHONE NO?
NO
1516
DISPLAY "NO MATCHED PHONE NUMBER"
YES
DISPLAY PHONE NO
1514
END

FIG. 15

MOBILE COMMUNICATION SYSTEM AND METHOD

The present invention relates generally to a mobile communication system, and in particular, to a system and method for allowing a non-CDMA subscriber, for example a TDMA subscriber such as a GSM subscriber, to use a SIM card even a CDMA service area.

Unlike a code division multiple access (CDMA) terminal, a GSM (Global System for Mobile communication) terminal has a subscriber identity module (SIM) card mounted in it. The SIM card, which is a smart card detachable from the terminal, includes therein a microprocessor and a memory chip for storing various information of the user. The SIM card is divided into an IC (Integrated Circuit) card type and a plug-in type. In the SIM card are stored subscriber information and information loaded in a pre-personalisation state. The subscriber information includes:

- Serial Number
- Service Code
- Block/Unblocking Status
- (Pre-)Personalization Data
- Authentication Algorithm Parameter
- Authentication Key
- Encryption Algorithm
- IMSI (International Mobile Subscriber Identity)
- (Pre-)Personalisation and Re-personalisation Key

- Cipher Key
- Cipher Sequence Number
- TESI (Temporary Mobile Subscriber Identity)
- LAI (Location Area Identity)
- Location Update Time
- Update State
- Forbidden PLMN (Public Land Mobile Network) List
- Access Control Class
- PIN (Personal Identification Number)
- PIN Error Count
- PUK (Personal Unblocking Key)
- Abbreviated Dialing
- Barring Outgoing Calls

Further, the IMSI includes an MCC (Mobile Country Code), an MNC (Mobile Network Code) and an MSIN (Mobile Subscriber Identification Number).

A GSM terminal (or GSM phone) using the SIM card operates in a communication method different from that of a CDMA terminal (or CDMA phone). Therefore, a user of the GSM terminal cannot use his GSM SIM card when traveling to a CDMA service area. In this case, the user conventionally leases a CDMA terminal to be provided with a call service, which inconveniences the user for payment of the call charge. Furthermore, the user cannot use various additional services registered

in the SIM card, such as an abbreviated dialing function. Therefore, there has been a demand for a method capable of allowing the GSM subscriber to use his SIM card even in the CDMA service area.

It is, therefore, an object of the present invention to provide a system and method for allowing a GSM subscriber to use his GSM SIM card in a CDMA service area.

It is another object of the present invention to provide a CDMA terminal mounted with a SIM card for use in a non-GSM service area, and a method for controlling the same.

Accordingly, a first aspect of the present invention provides a system for allowing a GSM subscriber to use a SIM card in a CDMA service area, the system comprising:

a CDMA terminal in which the SIM card can be mounted including a SIM interface for interfacing between the SIM card and a controller of the CDMA terminal, means for reading unique subscriber information for SIM card verification from the SIM card and sending the read unique subscriber information to a CDMA subsystem;

a CDMA subsystem for sending a verification confirm request for the SIM card to a GSM subsystem using the unique subscriber information and assigning a unique management number for the CDMA terminal mounted with the SIM card and sending the SIM card verification to the CDMA terminal when the GSM subsystem verifies the SIM card;

the GSM subsystem comprising means for verifying

the SIM card in response to the verification confirm request in response to the verification confirm request for the SIM card and sending the verification result to the CDMA subsystem.

It will be appreciated that the unique subscriber information preferably comprises an indication of MCC, MNC and MSIN of in the GSM SIM card and the unique subscriber information is sent to the CDMA subsystem.

An embodiment provides a system further comprising means for enabling the SIM card.

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

figure 1 is a block diagram illustrating a general GSM terminal;

figure 2 is a block diagram illustrating a general CDMA terminal;

figure 3 is a block diagram illustrating a CDMA terminal mounted with a SIM card according to an embodiment of the present invention;

figures 4 is a diagram illustrating the connection between a CDMA network and a GSM network via a public network, to which the present invention is applied;

figure 5 is a flow chart illustrating an initialisation procedure performed in a CDMA terminal mounted with a SIM card according to an embodiment of the present invention;

figure 6 is a flow chart illustrating an

initialisation procedure performed in a base station subsystem (BSS) of a CDMA network when a SIM card is mounted in a CDMA terminal, according to an embodiment of the present invention;

figure 7 is a flow chart illustrating an initialisation procedure performed in a GMSC of a GSM network when a SIM card is mounted in a CDMA terminal, according to an embodiment of the present invention;

figure 8 is a diagram illustrating a format of data transmitted from a CDMA terminal to a BSS of a CDMA network in an initialization procedure according to an embodiment of the present invention;

figure 9 is a flow chart illustrating a communication protocol when a GSM subscriber makes a phone call to the other subscriber using a CDMA terminal mounted with his own SIM card;

figure 10 is a flow chart illustrating a communication protocol when the other subscriber of a CDMA network makes a phone call to a CDMA terminal mounted with a SIM card;

figure 11 is a flow chart illustrating a communication protocol when a wire subscriber in a CDMA service area makes a phone call to a CDMA terminal mounted with a SIM card;

figure 12 is a flow chart illustrating a communication protocol when a GSM subscriber makes a phone call to a CDMA terminal mounted with a SIM card;

figure 13 is a flow chart illustrating a communication protocol when a wire subscriber in a GSM service area makes a phone call to a CDMA terminal

mounted with a SIM card;

figure 14 is a flow chart illustrating a phone number registering procedure for an additional service according to an embodiment of the present invention; and

figure 15 is a flow chart illustrating a procedure for searching phone numbers registered for an additional service according to an embodiment of the present invention.

Figures 1 and 2 illustrate block diagrams of a general GSM terminal and a general CDMA terminal, respectively. First, referring to figure 1, a GSM terminal includes an RF (Radio Frequency) unit 2, a kernel chip 4, an EEPROM (Electrically Erasable and Programmable Read Only Memory) 6, a flash ROM 8, a RAM (Random Access Memory) 10, a SIM card 14, a vocoder 16, a microphone MIC, a speaker SP, a display 18 and a key input unit 20. Here, the EEPROM 6, the flash ROM 8 and the RAM 10 constitute a memory 12. The RF unit 2 modulates an RF signal to be transmitted via an antenna and demodulates an RF signal received via the antenna. The kernel chip 4, comprising a controller, a SIM interface, a kernel coder/decoder, an adaptive equalizer and an RF interface, controls the overall operation of the GSM terminal. A commercial chip with a model number VP22003 is typically used for the kernel chip 4. A display 18, under the control of the kernel chip 4, displays key data input from the key input unit 20, an operating state of the GSM terminal, and various information in character and icon form. The key input unit 20 including numeric keys and function keys, outputs key data corresponding to a key pressed by a user and provides the key data to the

kernel chip 4. The memory 12, comprising the EEPROM 6, the flash ROM 8 and the RAM 10, stores various data required in operating the GSM terminal. The SIM card 14 which is detachable from the terminal, includes therein a microprocessor and a memory chip for storing various user information. The vocoder 16 including a speech coder/decoder, codes and decodes a voice signal. A commercial chip with a model number VP22020 is typically used for the vocoder 16.

Next, referring to figure 2, a CDMA terminal includes an RF unit 22, a BBA (Base-Band Analog) circuit 24, an MSM (Mobile Station MODEM (Modulator & DEModulator) 26, an EEPROM 28, a flash ROM 30, a RAM 32, a PCM (Pulse Code Modulation) codec 36, a microphone MIC, a speaker SP, a display 38 and a key input unit 40. Here, the EEPROM 28, the flash ROM 30 and the RAM 32 constitute a memory 34. The MSM 26 includes a controller 42, a MODEM 44, a deinterleaver and decoder 46, a vocoder 48, an interleaver and encoder 50, and a user interface 52. Further, the BBA circuit 24 comprises a digital-to-analog converter (DAC) 56 and an analog-to-digital converter (ADC) 54. The RF unit 22 down-converts an RF signal received at an antenna into an intermediate frequency (IF) signal and provides the IF signal to the ADC 54 in the BBA circuit 24. Further, the RF unit 22 up-converts an IF signal output from the DAC 56 in the BBA circuit 24 into an RF signal and transmits the RF signal over the antenna. The ADC 54 in the BBA circuit 24 converts an analog signal to a CDMA digital signal to provide the converted digital signal to the MSM 26, and the DAC 56 converts a CDMA digital signal to an analog signal to provide the converted analog signal to the RF unit 22. A BBA2.X (Q5312CDMA) chip manufactured by Qualcomm

company is typically used for the BBA circuit 24.

The CDMA MODEM 44 in the MSM 26 performs CDMA demodulation and symbol combining for a digital signal output from the ADC 54 in the BBA circuit 24 and provides the symbol combined digital signal to the deinterleaver and decoder 46. Further, the CDMA MODEM 44 performs a reverse operation for a signal output from the interleaver and encoder 50. The deinterleaver and decoder 46 deinterleaves and decodes the symbol combined data to generate error corrected data bits, and outputs the error corrected data bits in a data packet format to the vocoder 48 under the control of the controller 42. The interleaver and encoder 50 interleaves and encodes data output from the vocoder 48 and provides the output data to the MODEM 44. The vocoder 48 decodes data packet input from the deinterleaver and decoder 46 into PCM voice data and provides the PCM voice data to the PCM codec 36. Further, the vocoder 48 performs a reverse operation for PCM voice data input from the PCM codec 36.

The PCM codec 36 converts the PCM voice data output from the vocoder 48 to an analog voice signal and provides the analog voice signal to the speaker SP. The speaker SP converts the analog voice signal to an audible signal. The microphone MIC provides an analog voice signal input by the user to the PCM codec 36. It can be appreciated from figures 1 and 2 that the CDMA terminal is fundamentally different from the GSM terminal in that the CDMA terminal does not include a SIM card. Therefore, the CDMA terminal of figures 2 cannot use the various information in the SIM card 14 of the GSM terminal.

For this reason, a GSM subscriber cannot use his or her own SIM card in a CDMA service area (i.e., when traveling to the CDMA service area). Therefore, there is a demand for a CDMA terminal which can support the SIM card in the CDMA service area. In an embodiment, a SIM card is attachable to and detachable from the CDMA terminal so that the GSM subscriber may mount (or insert) his own SIM card in the CDMA terminal to use SIM information stored in the SIM card.

Figure 3 illustrates a CDMA terminal which can support a SIM card according to an embodiment of the present invention. It is noted that the CDMA terminal of figure 3 additionally includes a SIM card 62 and a SIM interface 60, compared with the general CDMA terminal of figure 2. The SIM interface 60 is preferably built in the MSM 26. In addition to the function of a SIM interface in the general GSM terminal, the SIM interface 60 interfaces between the MSM 26 and the SIM card 62.

Figure 4 illustrates the connection between a CDMA network and a GSM network via a public network, to which the present invention is applied.

The CDMA network comprises an NSS (Network and Switching Subsystem), a BSS (Base Station Subsystem), an OSS (Operating SubSystem) and a plurality of MS (Mobile Stations). The NSS includes an HLR (Home Location Register) and MSCs (Mobile Switching Centers), and the BSS includes BSCs (Base Station Controllers) and BTS (Base station Transceiver Subsystems).

In the CDMA network, one public land mobile network (PLMN) interworks with several HLRs and MSCs

to perform subscriber management and call exchange. Each HLR is connected to several MSCs; each MSC is connected to multiple BSCs; and each BSC is connected to multiple BTSs. The MSC controls connection to the BSCs, the public network and the PLMN. The BSC controls a radio link and performs a handoff. The BTS, together with the MSs, forms a radio channel and manages radio resources. Further, the HLR manages subscriber's location registration. A VLR (Visitor Location Register) provided to each MSC, is a database for temporarily storing information about an MS located in a service area of the corresponding MSC. When the MS travels to another service area, the MS information stored in the corresponding VLR is deleted. The OSS installed in every network, performs operation and maintenance of the corresponding network, billing, and management of subscribers and the MSs.

Similarly, the GSM network comprises an OSS, an NSS, a BSS and multiple MSs. However, the NSS of the GSM network includes a GMSC (Gateway Mobile Services Switching Center), an MSC, an EIR (Equipment Identity Register), an AC (Authentication Center), an SC (Service center), an OMC (Operation and Maintenance Center), an HLR (Home Location Register) and a VLR (Visitor Location Register). To establish a requested call, the GSM system first designates a GMSC. The designated GMSC then checks a phone number of the GSM subscriber to detect an accurate HLR. The GMSC is connected to the public network, for communication of a call.

The public network for connecting the CDMA system to the GSM system includes a PSTN (Public Switched

Telephone Network), a PSPDN (Packet Switched & Public Data Network), an ISDN (Integrated Service Digital Network), an ATM (Asynchronous Transfer Mode) network, etc.

To enable a GSM subscriber to use his own SIM card in a CDMA service area, there is required a mutual agreement between a CDMA system and a GSM system. For example, upon receipt of user information, the CDMA system determines country and network information of the user by analyzing the received user information, and makes the call charge according to a charging system of the corresponding country. Further, the public networks connected to the CDMA system and the GSM system should perform a procedure for determining whether a terminal mounted with a SIM card is located in the CDMA service area.

Now, a detailed description will be made regarding operations performed in a CDMA terminal, a BSS of the CDMA network and an NSS of the GSM network, in the case where a GSM subscriber uses a CDMA terminal mounted with his own SIM card in a CDMA service area. Herein, the NSS, BSS and OSS of the CDMA system will be referred to as a CDMA subsystem; the NSS, BSS and OSS of the GSM system will be referred to as a GSM subsystem.

Figure 5 illustrates an initialisation procedure performed in a CDMA terminal mounted with a SIM card according to an embodiment of the present invention. Figure 6 illustrates an initialisation procedure performed in a BSS of a CDMA network when the SIM card is mounted in the CDMA terminal, according to an embodiment of the present invention. Figure 7 illustrates an initialisation procedure performed in a

GMSC of a GSM network when the SIM card is inserted in the CDMA terminal, according to an embodiment of the present invention.

Now, with reference to figures 3 to 7, a description will be made regarding operations performed in the CDMA terminal mounted with the SIM card, the BSS of the CDMA network and the NSS of the GSM network, when a GSM subscriber inserted his own SIM card in the CDMA terminal in a CDMA service area.

Referring to figure 5, when a GSM subscriber inserts his own SIM card 62 in a CDMA terminal in a CDMA service area in a power-on state, the controller 42 of the CDMA terminal detects insertion of the SIM card 62 through the SIM interface 60 in an idle mode of operation, in steps 500 and 502. Upon detecting insertion of the SIM card 62, the controller 42 displays a password input request message on the display 38 in step 504. When the user inputs his password in response to the password input request message in step 506, the controller 42 determines in step 508 whether the input password is identical to its own password. That is, the controller 42 reads its own password from the SIM card 62 through the SIM interface 60 and compares it with the input password to determine whether they are identical to each other. When the input password is identical to its own password, the controller 42 of the CDMA terminal proceeds to step 510 to read an MCC (Mobile Country Code), an MNC (Mobile Network Code) and an MSIN (Mobile Subscriber Identification Number) from the SIM card 62 by means of the SIM interface 60. The MCC, MNC and MSIN are included in the IMSI (International Mobile Subscriber Identity). Thereafter, in step 512,

the controller 42 transmits the MCC, MNC and MSIN to a BSS of the CDMA network in a data format as shown in figure 8. Referring to figure 8, the data format includes 1-bit SIM insert/uninsert information, 3-bit MCC information, 2-bit MNC information and 10-bit MSIN information.

Referring to figure 6, upon receipt of the data (i.e., MCC, MNC and MSIN) in an idle state of step 600, the BSS of the CDMA network detects receipt of the data in step 602. Upon detecting receipt of the data, the BSS determines in step 604 whether the SIM card 62 is inserted in the CDMA terminal using the status of the SIM insert/uninsert information bit in the received data. Upon detecting insertion of the SIM card 62 in the CDMA terminal, the BSS of the CDMA network extracts the MCC and the MNC from the received data in step 606, to detect a country and a network code or id of the subscriber whose SIM card 62 is presently inserted in the CDMA terminal, that is, to which GSM mobile service the SIM card subscriber belongs. Thereafter, the BSS determines in step 608 whether the detected country and network code or id are agreed country and network code or id. In the exemplary embodiment, the BSS of the CDMA network has a memory table for storing a country, a network code or id and agreement/non-agreement information with respect to the MCC and MNC information. Therefore, the BSS of the CDMA network can detect the country and the network code or id in step 606 and determines whether the detected country and network code or id are agreed ones, in step 608, using the MCC and MNC information extracted from the received data and the memory table.

When the detected country and network code or id

are agreed, the BSS extracts MSIN information from the received data and sends a verification confirm request for the MSIN information to the GSM network, in step 610. For a verification confirm request, the BSS of the CDMA network sends data using the country and network code or id information, so that it may connect with an MSC of the GSM network, which verifies the MSIN information. With respect to the data transmission path during the verification confirm request, the data is transmitted from the BSS and the NSS of the CDMA network to the NSS of the GSM network via the public networks, as illustrated in figure 4. As stated above, the public network can include a PSTN (Public Switched Telephone Network), a PSPDN (Packet Switched & Public Data Network), an ISDN (Integrated Service Digital Network), an ATM (Asynchronous Transfer Mode) network, etc.

Upon receipt of the verification confirm request, the GMSC of the GSM network sends the verification confirm request data to the MSC of the GSM network using the country and network code or id information, and the MSC of the GSM network then determines the verification using the HLR. A detailed description will be made hereafter with reference to figure 7.

The NSS of the GSM network determines in step 700 whether the MSIN a verification confirm request has been received or not. Upon receipt of the MSIN verification confirm request, the NSS of the GSM network verifies the verification confirm-requested MSIN using the HLR in step 702. Thereafter, the NSS determines in step 704 whether the HLR has verified the MSIN. When the MSIN has been successfully verified, the NSS of the GSM network sends MSIN

verified information to the CDMA network in step 706. However, when the MSIN is not verified, the NSS sends MSIN unverified information to the CDMA network in step 708.

The BSS of the CDMA network then performs an operation according to the MSIN verification results. This operation is performed in steps 612 to 620 of figure 6.

Turning back to figure 6, the BSS of the CDMA network determines in step 612 whether the MSIN verification result data has been received from the GSM network. Upon receipt of the MSIN verification result data, it is determined in step 614 whether the received MSIN verification result data represents successful verification of the MSIN. When the received MSIN verification result data represents successful verification of the MSIN, the BSS of the CDMA network assigns a unique management number for the IMSI (i.e., MCC+MNC+MSIN) in step 616. Thereafter, the BSS updates the unique management number to the BSS, NSS and the public network in step 618. It can be appreciated that the CDMA terminal has an associated unique number known as an ESN and that a GSM terminal has an associated unique number known as an IMSI. The CDMA terminal subsystem, BSS, frees a spare ESN to allow an IMSI to be used instead. The ESN comprising IMSIs form part of the proper management numbers of the CDMA system. Further, in step 620, the BSS of the CDMA network sends verification data representing validity of the mounted SIM card to the CDMA terminal mounted with the SIM card.

Upon receipt of the verification data representing validity of the mounted SIM card from the

BSS of the CDMA network, the CDMA terminal is enabled to notify the user that the mounted SIM card is acceptable. This operation is performed in steps 514 to 518 of figure 5.

Referring back to figure 5, the controller 42 of the CDMA terminal determines in step 514 whether the SIM validity verification data has been is received from the BSS of the CDMA network. Upon receipt of the SIM validity verification data, the procedure proceeds to step 516 where the controller 42 enables the CDMA terminal to use the mounted SIM card. Thereafter, in step 518, the controller 42 notifies the user that the mounted SIM card has been verified, using the display 38 and/or the speaker SP. For example, a message "SIM CARD AVAILABLE" may be displayed on the display 38. By way of such initialisation procedures, the user can use a CDMA terminal in which his own SIM card is mounted, in making a phone call to another party or receiving an incoming call from another party.

First, with reference to figure 9, a detailed description will be made regarding a case where a GSM subscriber makes a phone call to another party using a CDMA terminal in which his own SIM card is mounted. When the user sends a call request to the other party using a CDMA terminal (or mobile station (MS)) mounted with his own SIM card (Step 900), the CDMA terminal sends a connect request message to a BSS and an NSS of the CDMA network. An MSC in the NSS then determines whether the user is one of its own subscribers (Step 910), that is, the MSC determines whether or not the subscriber is registered in the VLR of the MSC. If the user is its own subscriber, the MSC in the NSS sends a connect response to the CDMA terminal via the BSS.

However, when the user is not its own subscriber, the MSC sends the connect request to another MSC or an external network (e.g., public network). Upon receipt of a connect response from the other party via another MSC or the external network, the MSC in the NSS sends the connect response to the CDMA terminal via the BSS, thereby setting up a call.

In the meantime, when the call has ended, the NSS of the CDMA network sends a call time (or air time) and the other party's phone number to an OSS, to allow the OSS to calculate the call charge according to an agreement. When the OSS completes calculation of the call charge, the NSS sends the call charge information to a corresponding GSM network. An NSS of the GSM network then bills the SIM card's user for the call charge. Next, a detailed description will be made regarding the case where another party makes a call to a subscriber of a CDMA terminal mounted with a SIM card. In this case, the operations performed depend on whether the other party belongs to a CDMA network, a GSM network or an external wire network (i.e., public network).

Figure 10 illustrates a communication protocol when the other party is a subscriber of a CDMA network and makes a phone call to a CDMA terminal mounted with a SIM card. Figure 11 illustrates a communication protocol when a wire subscriber in a CDMA service area makes a phone call to a CDMA terminal mounted with a SIM card. Figure 12 illustrates a communication protocol when a GSM subscriber makes a phone call to a CDMA terminal mounted with a SIM card.

A. Case 1

With reference to figure 10, a detail description will be made regarding the case where the other party is a subscriber of a CDMA network and makes a phone call to a CDMA terminal mounted with a SIM card.

When the CDMA subscriber dials by pressing a country code and a GSM phone number (Step 1000) to send a call connect request, the NSS and BSS of the CDMA network determine whether a unique management number for the GSM phone number has been established, in response to the connect request from the CDMA terminal (Step 1010). When the unique management number has been updated, the NSS and BSS of the CDMA network control a call setup using the updated unique management number (1020), and send a connect response to the other subscriber of the CDMA network. Subsequently, a call is set up between the other subscriber of the CDMA network and the CDMA terminal mounted with the SIM card.

B. Case 2

With reference to figure 11, a detail description will be made regarding a case where a wire subscriber in a CDMA service area makes a phone call to a CDMA terminal mounted with a SIM card.

When the wire subscriber dials by pressing a country code and a GSM phone number (Step 1100) to send a call connect request to a public network connected to the CDMA network, the public network connected to the CDMA network determines whether the CDMA network has a unique management number for the GSM phone number (Step 1110). If the CDMA network has a unique management number, the public network sends a confirm request to the NSS and BSS of the CDMA

network, and the NSS and BSS of the CDMA network determine whether the unique management number has been updated (Step 1120). When the unique management number has been updated, the NSS and BSS of the CDMA network send a confirm response to the public network connected to the CDMA network. The public network connected to the CDMA network then sends a connect request to the NSS and BSS of the CDMA network. Upon receipt of the connect request, the NSS and BSS of the CDMA network control a call setup using the updated unique management number (1130), and send a connect response to the wire network subscriber in the CDMA service area via the public network connected to the CDMA network. Subsequently, a call is set up between the wire subscriber in the CDMA service area and the CDMA terminal mounted with the SIM card.

C. Case 3

With reference to figure 12, a detail description will be made regarding a case where a GSM subscriber makes a phone call to a CDMA terminal mounted with a SIM card.

When the GSM subscriber dials by pressing a GSM phone number (Step 1200) to send a call connect request to the BSS and NSS of the GSM network, the BSS and NSS of the GSM network determine whether a subscriber for the dialed GSM phone number is in the CDMA service area, in response to the connect request (Step 1210). When the GSM subscriber is in the CDMA service area, the BSS and NSS of the GSM network notify the GSM subscriber that the present call is an international call. If the GSM subscriber requests (or accepts) the international call in response to the international call notification (Step 1220), the BSS

and NSS of the GSM network send a connect request to the NSS and BSS of the CDMA network via a public network connected to the GSM network and the CDMA network. The NSS and BSS of the CDMA network then determine whether a unique management number for the GSM phone number has been updated, in response to the connect request (Step 1230). When the unique management number has been updated, the NSS and BSS of the CDMA network control a call setup using the updated unique management number (1240), and send a connect response to the GSM subscriber. Subsequently, a call is set up between the GSM subscriber in the CDMA service area and the CDMA terminal mounted with the SIM card.

D. Case 4

With reference to figure 13, a detail description will be made regarding a case where a wire subscriber in a GSM service area makes a phone call to a CDMA terminal mounted with a SIM card.

When the wire subscriber in the GSM service area dials by pressing a GSM phone number (Step 1300) to send a call connect request to a public network connected to the GSM network, the public network connected to the GSM network transfers the connect request to the BSS and NSS of the GSM network. The BSS and the NSS of the GSM network then determine whether a subscriber for the dialed GSM phone number is in a CDMA service area, in response to the connect request from the wire subscriber in the GSM service area (Step 1310). If the subscriber for the GSM phone number is in the CDMA service area, the BSS and NSS of the GSM network notify the wire subscriber in the GSM service area that the present call is an international call

via the public network connected to the GSM network. If the wire subscriber in the GSM service area accepts the international call in response to the international call notification (Step 1320), the BSS and NSS of the GSM network send a connect request to the NSS and BSS of the CDMA network via a public network connected to the CDMA network. The NSS and BSS of the CDMA network then determines whether a unique management number for the GSM phone number has been updated, in response to the connect request (Step 1330). When the unique management number has been updated, the NSS and BSS of the CDMA network control a call setup using the updated unique management number (1340), and send a connect response to the wire subscriber in the GSM service area. Subsequently, a call is set up between the wire subscriber in the GSM service area and the CDMA terminal mounted with the SIM card.

Next, with reference to figures 14 and 15, a detailed description will be made regarding operations of registering a phone number for an additional service (e.g., abbreviated dialing) using the CDMA terminal mounted with the SIM card and performing the additional service using the registered phone number. Figure 14 illustrates a phone number registering procedure for an additional service according to an embodiment of the present invention. Figure 15 illustrates a procedure for retrieving the phone number registered for an additional service according to an embodiment of the present invention.

First, with reference to figures 14 and 3, a detailed description will be given regarding an operation of registering a phone number to perform an

abbreviated dialing function using the CDMA terminal mounted with the SIM card. When the user inputs (or presses) a phone number registration function key using the key input unit 40, the controller 42 in the MSM 26 detects in step 1400 that the phone number registration function key has input. Upon detection of the input of the phone number registration function key, the controller 42 determines in step 1402 whether a phone number to be registered has been input. When the phone number has been input, the controller 42 displays on the display 38 a message requesting the user to choose a device where to register the phone number, in step 1404. For example, a message 1. SIM CARD, 2. INTERNAL MEMORY may be displayed. The user will then indicate whether he desires to register the phone number in the SIM card or the internal memory. The controller 42 determines in step 1406 whether the user has chosen one of the registration devices by pressing an associated numeric key. Upon detection of the numeric key input, the controller 42 registers the phone number in the selected device in step 1408. That is, when the user chooses the SIM card, the controller 42 registers the phone number in the SIM card 62; otherwise, when the user chooses the internal memory, the controller 42 registers the phone number in the internal memory, i.e., the RAM 32. The phone number mentioned in figure 14 can be a phone number for abbreviating dialing or other additional services.

Next, with reference to figures 15 and 3, a detailed description will be given regarding an operation of retrieving a phone number for abbreviated dialing using a CDMA terminal mounted with a SIM card. When the user inputs a phone book search function key using the key input unit 40, the controller 42 in the

MSM 26 determines in step 1500 whether a phone book search function key is input. Upon detection of the phone book search function key input, the controller determines in step 1502 whether search information has been received or not. Upon receipt of the search information, the controller 42 searches a list of phone numbers registered in the internal memory, i.e., the RAM 32, in step 1504.

Thereafter, it is determined in step 1506 whether the RAM 32 has a phone number corresponding to the received search information. When the RAM 32 has a phone number corresponding to the search information, the controller 42 retrieves the phone number from the RAM 32 and displays the retrieved phone number on the display 38 in step 1508. However, when the RAM 32 does not have a phone number corresponding to the search information, the controller 42 searches a list of phone numbers registered in the SIM card 62 in step 1510. After the search, the controller 42 determines in step 1512 whether the SIM card 62 has a phone number corresponding to the search information. When the SIM card 62 has a phone number corresponding to the search information, the controller 42 retrieves the phone number from the SIM card 62 and displays the retrieved phone number on the display 38, in step 1514. However, when the SIM card 62 does not have a phone number corresponding to the search information, the controller 42 displays on the display 38 a message indicating that there is no matched phone number, in step 1516.

As can be appreciated from the foregoing descriptions, a GSM subscriber may mount his own SIM card in a CDMA terminal in a CDMA service area, to use

various SIM information stored in the SIM card.

It will be appreciated that enabling the use of the SIM card includes enabling the additional services provided by or accessible using the SIM card to be invoked or accessed.

Although the above invention has been described with reference to use of a GSM SIM card within a CDMA context, the present invention is not limited thereto. It can be appreciated that the present invention is equally applicable to the use of SIM cards of, for example, IMT 2000 within a CDMA context. In effect, a subscriber of a mobile telecommunication that uses SIM cards, that is, a SIM card network subscriber, by using the present invention, can use that SIM card within a CDMA context.

While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

CLAIMS

1. A system for allowing a SIM card network subscriber to use a SIM (Subscriber Identity Module) card in a CDMA (Code Division Multiple Access) service area, the system comprising:

a CDMA terminal in which the SIM card can be mounted, including a SIM interface for interfacing between the SIM card and a controller of the CDMA terminal, means for reading unique subscriber information for SIM card verification from the SIM card and sending the read unique subscriber information to a CDMA subsystem;

a CDMA subsystem for sending a verification confirm request for the SIM card to a SIM card network subsystem using the unique subscriber information and assigning a unique management number for the CDMA terminal mounted with the SIM card and sending SIM card verification to the CDMA terminal when the SIM card network subsystem verifies the SIM card;

SIM card network subsystem comprising means for verifying the SIM card in response to the verification confirm request for the SIM card and sending the verification result to the CDMA subsystem.

2. The system as claimed in claim 1, wherein the unique subscriber information for SIM card verification includes in an IMSI (International Mobile Subscriber Identity).

3. The system as claimed in claim 2, wherein the IMSI includes an MCC (Mobile Country Code), an

MNC (Mobile Network Code) and an MSIN (Mobile Subscriber Identification Number).

4. The system as claimed in any preceding claim, wherein upon detection of verification of the SIM card, the CDMA terminal can use the SIM card and outputs an indication that the SIM card has been verified.

5. The system as claimed in claim 4, wherein the CDMA terminal outputs an indication that the SIM card has been verified using a display and/or a speaker.

6. The system as claimed in any preceding claim, wherein the CDMA subsystem for sending the verification confirm request for the SIM card to the SIM card network subsystem uses at least one of a country of the SIM card subscriber, a network code or id to which the SIM card subscriber belongs, and data as to whether or not an agreement has been made between an operator of the CDMA subsystem and the SIM card network subsystem to support CDMA calls using the SIM card.

7. The system as claimed in any preceding claim, wherein a public network comprises at least one of a PSTN (Public Switched Telephone Network), a PSPDN (Packet Switched & Public Data Network), an ISDN (Integrated Service Digital Network) and an ATM (Asynchronous Transfer Mode) network is used to support the exchange of a verification confirm request and the verification confirm request result.

8. A method for allowing a SIM card network subscriber to use a SIM card in a CDMA service area using a CDMA terminal including a SIM interface for interfacing between a SIM card and the CDMA terminal, the method comprising the steps of:

a) sending a verification confirm request for the SIM card to a CDMA subsystem using unique subscriber information stored in the SIM card;

b) upon receipt of the unique subscriber information for SIM card verification, sending, at the CDMA subsystem, a verification confirm request to a SIM card network subsystem using the unique subscriber information;

c) sending a verification result for the SIM card from the SIM card network subsystem to the CDMA subsystem in response to the verification confirm request; and

d) upon receipt of the verification result for the SIM card from the SIM card network subsystem, assigning, at the CDMA subsystem, a unique management number for the CDMA terminal mounted with the SIM card and sending SIM card verification result to the CDMA terminal to enable the CDMA terminal to use the SIM card.

9. The method as claimed in claim 8, further comprising the step of enabling the CDMA terminal to use the SIM card and outputting an indication of the SIM card verification result, in response to receipt of the SIM card verification result by the CDMA terminal.

10. The method as claimed in either of claims 8 or 9, wherein the step a) comprises the steps of:

displaying a password input request message as the SIM card is mounted in the CDMA terminal;

upon receipt of a password input by the user, determining whether the input password is identical to a stored password; and

sending the verification confirm request for the mounted SIM card to the CDMA subsystem using the unique subscriber information stored in the SIM card, when the input password is identical to the stored password.

11. The method as claimed in any of claims 8 to 10, wherein the unique subscriber information for SIM card verification includes an IMSI.

12. The method as claimed in claim 11, wherein the IMSI includes an MCC, an MNC and an MSIN.

13. The method as claimed in any of claims 8 to 12, wherein the CDMA subsystem for sending the verification request for the SIM card to the GSM subsystem uses information including at least one of a country of the SIM card subscriber, a network code or id to which the SIM card subscriber belongs, and data as to whether or not an agreement has been made between an operator of the CDMA subsystem and the SIM card network subsystem to support CDMA calls using the SIM card.

14. The method as claimed in any of claims 8 to 13, wherein a public network including at least one

of a PSTN, a PSPDN , an ISDN and an ATM network is used to support the exchange of information between the SIM card network subsystem and the CDMA subsystem.

15. A method for allowing a first subscriber of a CDMA terminal mounted with a SIM card to make a phone call to a second subscriber in a system which allows the first subscriber to use the SIM card in a CDMA service area using a CDMA terminal including the detachable SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal, the method comprising the steps of:

determining, at a CDMA subsystem, whether the second subscriber is a CDMA subscriber in response to a call request from the CDMA terminal mounted with the SIM card;

setting up a call to the second subscriber using a corresponding network, when the second subscriber is a CDMA;

upon completion of the call, calculating, at the CDMA subsystem, a call charge based on information required for call charge; and

sending the calculated call charge to a SIM card network system corresponding to the SIM card.

16. A method for allowing a first subscriber of a CDMA network to make a phone call to a second subscriber of a CDMA terminal mounted with a SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal in a system

which allows the second subscriber to use the SIM card in a CDMA service area using the CDMA terminal mounted with the SIM card, the method comprising the steps of:

allowing the first subscriber of the CDMA network to send a call request by inputting a country code and a SIM card network phone number for the second subscriber;

determining, at a CDMA subsystem of the CDMA network, whether a unique management number for the country code and the SIM card network number has been established, in response to the call request; and

setting up a call between the first subscriber of the CDMA network and the CDMA terminal mounted with the SIM card when the unique management number has been established.

17. A method for allowing a wire subscriber of a wire network to make a phone call to a subscriber of a CDMA terminal mounted with a SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal in a system which allows the subscriber to use the SIM card in a CDMA service area using the CDMA terminal mounted with the SIM card, the method comprising the steps of:

allowing the wire subscriber to send a call request by inputting a country code and a GSM phone number for a user of the SIM card;

determining whether a unique management number for the country code and the GSM number has been updated, in response to a call request;

and

setting up a call between the wire subscriber and the CDMA terminal mounted with the SIM card when the unique management number has been updated.

18. A method for allowing a SIM card network subscriber to make a phone call to a CDMA subscriber of a CDMA terminal mounted with a SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal, the SIM card having an associated SIM card network phone number, in a system which allows the CDMA subscriber to use the SIM card in a CDMA service area using the CDMA terminal, the method comprising the steps of:

allowing the SIM card network subscriber to send a call request by dialing the associated GSM phone number;

determining whether a subscriber of the associated SIM card network phone number is in a CDMA service area, in response to the call request;

notifying the SIM card network subscriber that the call request is an international call, when the subscriber of the associated GSM phone number is in the CDMA service area; and

setting up a call between the SIM card network subscriber and the CDMA terminal mounted with the SIM card when the SIM card network subscriber accepts the international call.

19. A method for allowing a first wire subscriber to make a phone call to a second subscriber of a CDMA terminal mounted with a SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal, the SIM card having an associated GSM phone number, in a system which allows the second subscriber to use the SIM card in a CDMA service area using the CDMA terminal mounted with the SIM card, the method comprising the steps of:

allowing the first wire subscriber to send a call request by dialing the SIM card network phone number associated with the SIM card;

determining, whether the CDMA terminal mounted with the SIM card having the associated GSM phone number is in the CDMA service area, in response to the call request; and

notifying the first wire subscriber that the call request is an international call, when the CDMA terminal with the SIM card having the associated SIM card network phone number is in the CDMA service area; and

setting up a call between the first wire subscriber and the CDMA terminal mounted with the SIM card via a public network, when the first wire subscriber accepts the international call.

20. A method for registering and searching a phone number in a system which allows a subscriber to use a CDMA terminal including a detachable SIM card and a SIM interface for interfacing between the SIM card and the CDMA terminal, the method

comprising the steps of:

outputting, in response to the user having input a phone number registration function key and a phone number to be registered, a message requesting the user of the CDMA terminal to choose one of a plurality of devices in which to register the phone number;

registering the phone number in the chosen device;

searching a list of phone numbers stored in at least the chosen device upon receipt of a signal from a phone book search function key and search information; and

upon detection of a phone number corresponding to the search information, providing the phone number to the user.

21. A method as claimed in claim 20, wherein the plurality of devices includes at least one of a SIM card and a memory of the CDMA terminal.

22. A system for allowing a SIM card network subscriber to use a SIM card with a CDMA terminal in a CDMA service area substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

23. A method for allowing a SIM card network subscriber to use a SIM card with a CDMA terminal in a CDMA service area substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

24. A method for registering and searching a phone number in a system which allows a subscriber to use a CDMA terminal having a SIM card and SIM card interface between the CDMA terminal substantially described herein with reference to and/or as illustrated in the accompanying drawings.

25. A CDMA terminal for using in a method or system as claimed in any preceding claim.

26. A CDMA terminal for allowing a SIM card network subscriber to use a SIM card in a CDMA service area, the CDMA terminal comprising a SIM interface for interfacing between the SIM card and a controller of the CDMA terminal, means for reading unique subscriber information for SIM card verification from the SIM card and sending the unique subscriber information to a CDMA subsystem, and means for enabling the SIM card upon receipt of verification for the SIM card.

27. A CDMA terminal as claimed in claim 26, wherein the unique subscriber information for SIM card verification includes in an IMSI (International Mobile Subscriber Identity).

28. A CDMA terminal as claimed in claim 27, wherein the IMSI includes an MCC (Mobile Country Code), an MNC (Mobile Network Code) and an MSIN (Mobile Subscriber Identification Number).

29. A CDMA terminal as claimed in any of claims 26 to 28, wherein upon detection of verification of the SIM card, the CDMA terminal can use the SIM card and outputs an indication that the SIM card has

been verified.

30. A CDMA terminal as claimed in claim 29, wherein the CDMA terminal outputs an indication that the SIM card has been verified using a display and/or a speaker.

31. A CDMA terminal for allowing a SIM card network subscriber to use a SIM card in a CDMA service area substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

32. A system or method as claimed in any preceding claim, in which the SIM card network subscriber is a GSM subscriber, the SIM card network subsystem is a GSM subsystem and the SIM card network subscriber phone number is a GSM phone number.

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Application No: GB 9926327.9 **Examiner:** Robert Macdonald
Claims searched: 1-14, 22-25, 31 and 32 **Date of search:** 10 May 2000

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L(LDSC, LDSKA, LEF, LEP)

Int Cl (Ed.7): G06K(7/00); H04B(1/707); H04Q(7/32, 7/38)

Other: ONLINE: WPI, PAJ, EPODOC, TXTWO1, TXTGB1, TXTEP1, TXTUS1, TXTUS2

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2324004 A	(SAMSUNG ELECTRONICS CO.) See whole document	
A,E	EP 0883318 A1	(ICO SERVICES LTD.) See lines 40-58 of col. 1, lines 50-54 of col. 19, and claim 1.	
A	EP 0869692 A1	(ICO SERVICES LTD.) See lines 51-54, col.19; lines 9-14, col.12	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.